Yakubu. I. *et al*, International Journal of Advances in Agricultural Science and Technology,
Vol.5 Issue.5, May- 2018, pg. 25-32 ISSN: 2348-1358
Impact Factor: 6.057
NAAS Rating: 3.77

Influence of Allelochemicals Substances in Eucalyptus Species on Agricultural Crops: A Review

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Abstract: ***This paper aimed at compilling literatures on the effects of allelochemical of eucalyptus species on agricultural crops .Eucalyptus species releases many bioactive chemicals from its various parts such as leaves, stem, root and sometimes decomposed body through different mechanism into its surrounding environment. These bioactive chemicals are often termed as allelochemicals because they interact with the surrounding environment. Effects of allelochemicals to the agricultural crops are well documented. Many researchers found that this allelochemicals have detrimental effects on the successive crops production which causes ecological and economic threat such as decline in total crop yield .This paper review shows that, agricultural crops should not be interface with Eucalyptus species especially during the seed germination and early growth of seedlings and also, soil underneath eucalyptus plantation should not use in raising agricultural seeds.***

Keywords: Eucalyptus, Agricultural crops, Allochemicals.

INTRODUCTION

Allelochemical or allelopathy is "the direct or indirect detrimental influence of one plant (including microorganisms) on the germination, growth, or development of other plants through the production and introduction of chemical substances into the environment. It therefore differs from competition wherein plants struggle a common resource" (Rana devi *et al*., 1997). Such

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substances with autotoxic or antibiotic properties, have been found in many plant species, aquatic as well as terrestrial. Most of them are secondary metabolites. Allelochemicals can inhibit the growth of several crops, and may decrease agri- and silvicultural yields. They might also gain importance as natural pesticides (Rana devi *et al*., 1997). There are four major routes by which allelochemicals are released into the environment: (1) root exudation, (2) volatilization, (3) leaching, (4) biodegradation. The relative importance of these routes depends on the plants, the chemical nature of the synthesized allelochemicals and characteristics of habitat and climate. Allelochemicals exert their effects through various modes of action. They may influence cell division and elongation, growth regulators, enzymes, respiration, photosynthesis or chlorophyll content, stomata and membrane properties, water relations and ion uptake. Allelochemicals have harmful effects on crop in the ecosystem resulting in reduction in growth and yield. (Ghafar et al.,2000) Khan et al.,(2004) stated that, aqueous extract of Eucalyptus leaves is significantly reduced seed germination, root and shoot length, fresh and dry weight of maize to control treatment. Similarly Blaise,et al.,(1997) reported a significant decreased in germination of Maize seed in field surrounded by Eucalyptus trees. In many cases dual effects of allelochemicals have been documented. For example, low concentrations of certain allelochemicals may activate enzyme activity while high concentrations inhibit it (Rana Devi *et al*., 1997) Allelochemicals compounds had injurious effects growth development of crop plants. Allelochemicals release either from the leaves, stem, and bark of living or dead tree or plants can be classified into terpenes,glucocides,coumanines,aldehyds and phenolics compounds.The leaves of Eucalyptus are main releasing source of toxic compounds.

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Ayyaz khan *et al*., (1999) carried out a researched on allelopathic effect of eucalyptus on soil characteristics and growth of maize and found out that,the aqueous extract of *eucalyptus camaldulensis* reduce germination,seedling height, fresh shoot weight and fresh root weight of maize seed. Sasikumar *et al*.,(2001) conducted a researched on allelopathic effects of four Eucalyptus species on Redgram(*Cajanus cajan L.*) and found out that germination was inhibited by each individual compound tested while vigour index was significantly affected by catechol. Victoria Adeorike *et al*.,(2001) carried out a researched on the evaluation of allelopathic influence of selected multipurpose tree species on Maize*(zea mays*) under a simulated field condition and based on evaluation the result showed that, there was a significant differences at $p \leq 0.05$ in the germination percentage of maize seed among the MPTs studied. While Sasikumar *et al*.,(2004) performed a research on allelopathic effects of four Eucalyptus species on cowpea *(Vigna unguigulata*) and found out that, the germination was inhibited in all the cases except catechol and cumeric acid at 2mm concentration. Based on the effect of allelochemicals of Eucalyptus species, Muhammad *et al*.,(2007) studied the effect of aqueous extracts of *Eucalyptus camaldulensis L*. on germination and growth of maize(*Zea mays* L.) and found out that seed germination(%) was reduced as a result of extract application.Same researcher Muhammad *et al*.,(2008) conducted a researched on suppressing effect of *Eucalyptus camaldulensis L*. on the germination and seedling growth of six weeds the result showed that, germination of weeds was adversely affected and count of normal seedlings was significantly lower than control due to suppressing effect of extract. Espinosa *et al*.,(2008) performed a researched on allelopathic potential of Eucalyptus spp plantation on germination of early growth

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annual crops and found that, the inhibitory effect was minimum on maize and maximum on black bean among the three Eucalyptus species. Abugr *et al*., (2011) carried out an investigation on allelopathic effects of ten tree species on germination and growth of four traditional food crops in Ghana,and found out that, roots extract of *Senna siamea* promoted germination of both *Zea mays* and *Lycopersicon esculentum* seeds. Another researcher Shapl *et al*., (2011) studied the allelopathic effects of multipurpose tree species*(melia azedarach*) with emphasis on agricultural crops and found out that, the inhibition of germination and growth parameters of mungbean and soybeans were varied according to the different parts of plants and soil from different place. Sirawdink *et al*.,(2011) performed a study on allelopathic effect of Eucalyptus camaldulensis on germination and growth of tomato and found out that,the aqueous shows a significant inhibitory effect on germination of root and shoot elongation of tomato plants. Rassaeifar *et al*.,*(*2013) investigate the effect of eucalyptus globulus essential oil on seed germination and seedling establishment of *Amaranthus blitoides* and *Cyndon dactylon*, the findings showed the germination (%) rate, radicle's and plumule's length, seedling height, primary root lenght and pedicle's length are significantly decreased. While Mahmood *et al*., *(*2014) performed a researched on allelopathic effect of Eucalyptus globulus label on seed germination seedlings growth of eggplant(*Solanum melongena* L.) and found that all extracst had inhibitory effect on germination and seedling growth. Also, Manoj *et al*.,(2014) carried out a study on allelopathic effect of some agroforestry tree species on soya bean and the study showed that, irrigation with aqueous leaf extract of the woody species produce maximum adverse effect on seed germination, relative and vigor index, root and shoot length. Ghanuni, *et al*.,(2015) conducted a researched on

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the allelopathic effect of (*eucalyptus camaldulensis*) on peanut*(Arachis hypogaea*) crop and purple nutsedge *(cyperus rotundus*) weed and found out that, treated soil in the pot exhibited a significant reduction in germination and seedling growth of purple nutsedge and peanut plants. Fuad *et al*.,(2015) performed a researched on the adverse effects of allelopathy from legumes crops and its possible avoidance and the finding showed that, this allelochemicals have both positive and detrimental effects on the successive of legumes crops. Akshita. *et. al*.,*(*2015) investigate the effect of leaf leachates of different trees species on germination and growth of various agricultural crops and found out that, among the tested crops,wheat recorded the highest. Hegab. *et al*.,(2016) carried out a researched on the allelopathic potential of *Eucalyptus rostrata* leaf residue on some metabolic activities of *zea mays* L. and found out that,lower level of eucalyptus treatment (0.5%w/w) induced a stimulatory effect on growth of shoot and root of corn plants.

Conclusion

In the field of agricultural crops allelopathy extensive research has been done and a great numbers of allelochemicals responsible for allelopathy have been identified. For sustainable crop production in agriculture, allelopathy research is very important. As it has been proven to cause a great loss in total crops yield which is a major threat to the food production. Therefore, a continuous research on allelopathy knowledge on plant physiology and ecology is necessary in order to help to evaluate the synthesis and release of allelochemicals of plants in its surrounding

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environment. Lack of information on the above two aspects of plants, chemical analysis is worthless.

The application of genetic approaches in allelopathy has started to open a new era in allelopathy research. Since, the effects of allelochemical of eucalyptus is largely on seed germination and seedling growth. Therefore, agricultural crops should not be grown with Eucalyptus species especially at germination and early growth stage and in addition utilization of soil under the Eucalyptus species plantation fot nursery and seedlings urturing related practice is not recommended as it may contains some allelochemical that may delay or affect the germination process.

To understand the allelopathic mechanism in agricultural crops, further study on the production, role, and fate of allelochemicals in many agricultural crops with the surrounding ecosystem are necessary by using all the mentioned knowledge and techniques.

References:

[1]. Abugre S., Apetorgbor,A.K., Antwiwaa, A. and Apetorgbor, M.M. (2011) Allelopathic effects of ten tree species on germination and growth of four traditional food crops in Ghana. *Journal of agricultural technology 7(3):825-834*

[2]. Akshita bang, Ops bana, S.chaturvedi,R.kaushal, S.Tewari, J.pandey and Priyanka (2015) Effect of leaf leachates of different tree species on germination and growth of various agricultural crops. *Journal of tree sciences volume 34 No.2*

[3]. Ayyaz khan M., T.A.khitran, M.S.baloch and M, Z.sulemani (1999) Allelopathic effect of Eucalyptus on soil characteristics and growth of maize.*Pakistan journal of biological sciences,2(1):390-393*

[4]. Blaise, D.,P.C.tyagi, O.P.S.khola and S.P.ahlawat, (1997) Effect of Eucalyptus on wheat, maize and cowreas, *Allelo journal 4:341-344*

 ISSN: 2348-1358
Impact Factor: 6.057
NAAS Rating: 3.77

[5]. Espinosa-Garcia,F.J., E.martine-Hernandez and A.quiroz-Flores (2008) Allelopathic potential of Eucalyptus spp plantations on germination and early growth of annual crops. *Allelopathic journal 21(1):25-37*

[6]. Faud mondal md., md.Asaduzzaman, T.asao (2015) Adverse effects of allelopathy from legumes crops and its possible avoidance, *American journal of plants sciences,2015,6,804-810*

[7]. Ghafar, A.B. saleem and M.J.qureshi. (2000) Allelopathic effects of sunflower on germination of wheat. *Pakistan journal of biological science, 3(8):1301-1302*

[8]. Ghanuni, A.M., Elshebani,A., moftah, M.A. and Lajili, A.N. (2015) Allelopathic effect of (Eucalyptus camaldulensis) on peanut(Arachis hypogaea) crop and purple nutsedge(Cyperus rotundus)weed, *Scholarly journal of agricultural science vol.5(6):pp,189-194*

[9]. Hegab, M.M., Gabr, M.A., Al-wakeel, S.A.M. and Hamad, B.A. (2016) Allelopathic potential of Eucalyptus rostrata leaf residue on some metabolic activities of zea mays L. *Universal journal of plant science 4(2):11-21*

[10]. Khan, M.A.K.B. marwat and G.hassan. (2004) Allelopathic potential of some multipurpose tree species on wheat and some of its associated weeds. *Intl.journal of biology biotechnology., 1(3):275-278*

[11]. Mahmood D., S.S.khaleghi and R.ataollahi (2014) Allelopathic effects of Eucalyptus globulus labill.on seed germination and seedling growth of eggplant(Solanum melongena L.*)* *IJFAS journal-2014-3-1/81-86/*

[12]. Manoj K.T. (2014) Allelopathic effect of some agroforestry tree species on soya bean, *International journal of farm sciences 4(2):107-113*

[13]. Muhammad A.khan, I.hussain and E.A.khan (2007) Effect of aqueous extract of Eucalyptus camaldulensis L. on germination and growth of maize(zea mays L.), *Pakistan journal of weed science,Res. 13(3-4):177-182*

[14]. Muhammad A.khan, I.hussain and E.A.khan (2008) suppressing effects of Eucalyptus camaldulensis L. on germination and seedling growth of six weed, *Pakistan journal of science,Res. 14(4-4):201-207*

[15]. *Rana devi, S.,Pellissier, F.,M.N.V. (1997) "Allelochemicals" in prasad, M.N.V.(Ed): Plant Ecophysiology, pp. 253-293.New York: John wisely & sons.*

[16]. Rassaeifar, M., N.husseini asi, P.zandi and A.M.aghdam (2013) Allelopathic effect of Eucalyptus globulus essential oil on seed germination and seedling establishment of Amarathus blitoides and Cyndon dactylon, *Trakia journal of sciences No1,pp 73-81*

ISSN: 2348-1358
Impact Factor: 6.057
NAAS Rating: 3.77

[17]. Sasikumar, K., C.vijiya lashmi and K.T.parthiban (2001) Allelopathic effect of four Eucalyptus species on Redgram(Cajanus cajan L.) *Journal of tropical agriculture 39(2001): 134-138*

[18]. Sasikumar, K., C.vijiya lashmi and K.T.parthiban (2004) Allelopathic effect of four Eucalyptus species on Cowpea(Vigna unguiculata) *Journal of tropical sciences 16(4):419-428*

[19]. Shapla TL., parvin R., Amin M.H, A., rayhan (2011) Allelopathic effect of multipurpose tree species(Melia azedarach) with emphasis on agricultural crops, Journal of innovation, development and strategy 5(1):70-77

[20]. Sirawdink, F.yesus, Z.kebebew, A.nebiyu, N.zeleke and S.bogale(2011) Allelopathic effect of (Eucalyptus camaldulensis) on germination and growth of tomato. *American eurosian journal of agriculture and enviromental sciences,11(5):600-608*

